

Memorandum

December 21, 2022

To: U.S. Environmental Protection Agency

From: David Haury, Amanda Shellenberger, and Paul LaRosa, Anchor QEA, LLC

Re: East Branch Early Action Focused Feasibility Study Alternatives Memorandum

This memorandum documents the proposed remedial alternatives to be evaluated in the East Branch Early Action Focused Feasibility Study (FFS) and is intended to identify and achieve consensus on these proposed remedial alternatives from the U.S. Environmental Protection Agency (USEPA) prior to FFS development. This memorandum was requested by the USEPA in an email from Mark Schmidt of the USEPA to David Haury of Anchor QEA, LLC, dated October 18, 2022. The alternative descriptions presented in this memorandum are high-level summaries of the proposed alternatives. A more detailed description of each alternative, including supporting information regarding the development of alternatives and subsequent analysis of the alternatives, will be provided in the East Branch FFS Report. Alignment on the alternatives prior to the FFS submittal will expedite the overall FFS schedule and will expedite remedy selection.¹

Development of Remedial Alternatives

As described in the *Feasibility Study Work Plan Addendum 1: East Branch Early Action Focused Feasibility Study Work Plan* (Anchor QEA 2022), because this is an FFS for an early action, the remedial alternatives will be limited to those alternatives that are consistent with the currently understood conceptual site model and will be composed of proven General Response Actions (GRAs) and remedial technologies used at other sediment sites.

Areas to Be Considered for Remediation

As will be further explained in the FFS, the proposed footprint of each of the alternatives (with the exception of the no action alternative [Alternative EB-A]) is the entirety of East Branch.² That is, one or more of the selected remedial technologies and process options described below will be applied individually, or in combination, to the entire area of East Branch. Application of these technologies will result in an immediate reduction of human health and ecological risks by reducing surface sediment (i.e., defined as the top 15 centimeters [6 inches] below the mudline) concentrations to below sediment

¹ This deliverable is further discussed in the *Feasibility Study Work Plan Addendum 1: East Branch Early Action Focused Feasibility Study Work Plan* (Anchor QEA 2022a).

² The surface sediment contaminant concentrations were used as a metric to delineate the lateral extent of remediation in East Branch, and almost the entire spatial extent of surface sediment exceeds the Preliminary Remediation Goals or expected Remedial Action Levels (RALs) for one or more contaminants. The areas with no PRG or expected RAL exceedances are relatively small and isolated, so due to constructability reasons would be actively remediated in the active remediation alternatives in East Branch. RALs will be developed in the FFS.

cleanup levels at time-zero after construction. The FFS will evaluate how effective each alternative is at addressing all contaminated media that pose (or will potentially pose) unacceptable risks and/or serve as long-term sources of contamination that may require remediation.

Selected Remedial Technologies and Process Options

The following process options and remedial technologies were used to assemble the remedial alternatives presented in this memorandum:

- **No Action:** Required by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 Code of Federal Regulations [CFR] §300).
- **Institutional Controls (ICs):** The term “institutional control” generally refers to non-engineering measures (such as administrative and legal controls) intended to affect human activities in such a way as to prevent or reduce exposure to hazardous substances, often by limiting land or resource use. (USEPA 2005). There are four general categories of ICs:
 - Proprietary controls (administered on private lands)
 - Government controls with the following process options:
 - Activity restrictions for fishing or crabbing
 - Consumption advisories
 - Dredging restrictions
 - Enforcement and permit tools with institutional control components
 - Informational devices

ICs may be used in the short term (during active remedy implementation to minimize potential for human exposures during construction) and in the long term (after active remedy implementation to minimize potential exposures during (and potentially after) system recovery).

It is important to note that the development of detailed ICs that are effectively integrated into the overall remedy can be a relatively complex process, and that activity will most likely be completed as part of the Operable Unit 1 process. For example, efforts such as use restrictions and informational devices may need to be developed as comprehensive plans, requiring close coordination among USEPA, other federal agencies, and New York State.

Consequently, for the purposes of the FFS, it is assumed that the three most common types of ICs at sediment sites (fish consumption advisories, waterway use restrictions, and land use restrictions) (USEPA 2005) will be included in the active alternatives (i.e., all alternatives except for the no action alternative) to recognize their general function and necessity within the overall remedy. A detailed interim IC plan is not anticipated to be developed as part of the FFS.

- **Containment**
 - **Capping:** A sand cap, armored cap, reactive cap, or armored reactive cap, as appropriate, based on modeling of dissolved phase contaminant of concern (COC) fate and transport and conditions in localized areas within East Branch.
- **In Situ Treatment³**
 - **Immobilization Treatment:** Sequestration via in situ stabilization and solidification (ISS) may be effective in localized areas or where other GRAs and technologies are not feasible (e.g., adjacent to unstable shorelines or sensitive structures). ISS can also be effective at sequestering nonaqueous phase liquid (NAPL).
- **Removal**
 - **Dredging:** While mechanical and hydraulic dredging would be effective and implementable in East Branch, the presence of debris in East Branch would reduce the technical implementability of hydraulic dredging, due to entanglement within equipment, as well as pipeline blockage concerns. Prior to hydraulic dredging, a pre-dredge debris removal step may be necessary in areas with debris. Therefore, mechanical dredging is selected as a representative process option for the purposes of developing remedial alternatives.
- **Ex Situ Treatment⁴**
 - **Chemical Treatment:** Dredged material stabilization/solidification through treatment with one or more amendments. Ex situ stabilization/solidification may be used for sediment dewatering purposes only and/or to reduce the mobility of the chemical constituents (as necessary) to meet beneficial use or landfill disposal criteria.
- **Disposal**
 - **Upland Disposal:** Dredged material disposal in a Subtitle C or Subtitle D landfill, depending on the waste profile in each dredging area.

These remedial components (technologies/process options) are considered technically and administratively implementable in East Branch. These components are also proven technologies in sediment remediation projects that have been implemented at other similar sites. The equipment, materials, and personnel to implement the technologies/process options are readily available.

³ USEPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (USEPA 2005) states, "In general, treatment processes have the ability to reduce sediment contaminant concentrations, mobility, and/or sediment toxicity by contaminant destruction or by detoxification, by extraction of contaminants from sediment, by reduction of sediment volume, or by sediment solidification/stabilization." This description of treatment applies to both in situ and ex situ treatment.

⁴ See Footnote 3.

Description of the Remedial Alternatives

USEPA's guidance on conducting a remedial investigation/feasibility study (RI/FS) (USEPA 1988) states, *"Alternatives should be developed that will provide decision-makers with an appropriate range of options and sufficient information to adequately compare alternatives against one another."*

Therefore, a range of alternatives is presented in this section.

Final selection of technologies and the evaluation of remedial alternatives will consider opportunities for reducing the environmental footprint of remedial design and construction activities, as well as the sustainability and climate resiliency of the alternative. Additional activities that are ancillary to the selected technologies will be incorporated into the remedial alternatives.

In addition to a no action alternative (Alternative EB-A), five alternatives with active remediation (Alternatives EB-B, EB-C, EB-D, EB-E, and EB-F) were developed. Each of the active remediation alternatives include ICs and monitoring in addition to the specific technologies (i.e. dredging, capping, and ISS) detailed in the following subsections. Alternative EB-B was developed as the least intrusive alternative that could reasonably be evaluated in the detailed analysis of alternatives. Each subsequent alternative was sequentially modified to increase the scope of the remedy (e.g., increase areas or depths of dredging).

For the active remediation alternatives that include capping as a remedial technology, it is assumed that caps will require a chemical isolation layer and armoring, as needed, to be protective of human health and ecological receptors over time. A 3-foot cap thickness was used in this memorandum to develop the active remediation alternatives. The thickness is based on preliminary cap modeling and is assumed to consist of a 1-foot chemical isolation layer, a 1-foot erosion protection layer, and 1 foot of overplacement allowance (6 inches per layer) to account for construction tolerances. The assumed cap thickness in East Branch will be reevaluated and refined, as needed, in the FFS. If the cap thickness is adjusted, the dredge depth in areas of capping for Alternatives EB-B, EB-C, EB-D, and EB-E will be adjusted to maintain the intent of the alternative. For example, for Alternative EB-C, the intent is that current mudline elevations would be maintained following remedy implementation, so if it is determined during FFS evaluations that a thicker cap is needed, additional dredging would be performed to maintain current mudline elevations.

The alternatives are presented in the following subsections and are summarized in Table 1 for ease of comparison. A more detailed description of each alternative, including supporting information regarding the development of alternatives and subsequent analysis of the alternatives, will be provided in the East Branch FFS Report.

Table 1
Summary of Remedial Alternatives

Alternative	Alternative Summary
Alternative EB-A	No action
Alternative EB-B	Remove sediments above -3 feet MLLW and place a 3-foot-thick sand reactive cap or armored reactive cap to have the cap installed entirely at (or below) 0 foot MLLW.
Alternative EB-C	Dredge 3 feet and place a 3-foot-thick sand reactive cap or armored reactive cap to maintain the existing water depth.
Alternative EB-D	Dredge 3 feet and place a 3-foot-thick sand reactive cap or armored reactive cap to maintain the existing water depth. In select areas, remove soft sediments to native material to optimize the remedy.
Alternative EB-E	Dredge the federally authorized navigation channel to a depth necessary to accommodate a cap below the current authorized depth plus a buffer or to native material, whichever is shallower. Areas dredged to native material would include backfill, if necessary. Dredge and/or cap outside of the navigation channel.
Alternative EB-F	Dredge all soft sediments and backfill if necessary. Place sand or armored reactive caps over areas with high groundwater dissolved phase contaminant concentrations and/or high rates of advection in native material.

Notes:

A 3-foot-cap thickness was assumed for this memorandum and will be reevaluated and refined, as needed, in the FFS.

For all alternatives with active remediation (i.e., all except Alternative EB-A), ISS would be implemented at localized scales in areas where other GRAs and technologies are not feasible (e.g., adjacent to unstable shorelines or sensitive structures).

MLLW: mean lower low water

Alternative EB-A: No Action

Under this alternative, no active remediation or monitoring would be conducted. Therefore, the existing conditions in the East Branch would not change. Alternative EB-A is being presented for comparison with the other alternatives, as required by the NCP (40 CFR 300.430[e][6]). Current fish consumption advisories that have been implemented outside of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process would be expected to continue, but Alternative EB-A would not include implementation of any new ICs or monitoring.

Alternative EB-B

Removal of sediments that are currently above elevation -3 feet mean lower low water (MLLW) would occur. This would allow a 3-foot-thick sand cap amended with reactive media (i.e., "sand reactive cap") or armored reactive cap to be installed entirely at (or below) 0 feet MLLW. In areas with surface sediment below elevation -3 feet MLLW, a sand reactive cap or armored reactive cap would be placed on the existing grade, which would result in an increased mudline elevation. For this alternative, it is expected that there would be more cap material placed than sediment removed via dredging; therefore, this alternative would likely result in a mudline elevation that is shallower on average than the current mudline. This will be confirmed during more detailed evaluations of the alternatives that will be presented in the FFS Report.

ISS would be implemented in localized areas where other GRAs and technologies are not feasible (e.g., adjacent to unstable shorelines or sensitive structures).

Dredged material would be treated through stabilization/solidification with amendment as necessary to further reduce the moisture content of the material and meet transport and disposal requirements. Dredged material would be disposed of in an off-site permitted Subtitle C or Subtitle D landfill, depending on the waste profile for a given dredged material management area.

As discussed above, three categories of ICs would be included to recognize their general function and necessity within the overall remedy.

Alternative EB-C

Alternative EB-C would include the same remedial technologies and process options as Alternative EB-B. Under this alternative, 3 feet of sediment would be removed prior to installation of a 3-foot-thick sand reactive cap or armored reactive cap. Under this alternative, current mudline elevations would be maintained following remedy implementation.

Although the post-remedy surface sediment concentrations would be similar between Alternatives EB-B and EB-C, Alternative EB-C includes additional dredging so that the remedy would not alter the current water depths in East Branch.

ISS would be implemented in localized areas where other GRAs and technologies are not feasible (e.g., adjacent to unstable shorelines or sensitive structures).

Alternative EB-D

Alternative EB-D would include the same remedial technologies and process options as Alternatives EB-B and EB-C. Under this alternative, 3 feet of sediment would be removed prior to installation of a 3-foot-thick sand reactive cap or armored reactive cap, or sediment would be removed down to native material in select areas and covered with a sand backfill layer, if necessary, to manage residuals based on post-dredge sampling. This would be an alternative that could be optimized based on cost effectiveness, and the areas of 3-foot dredge and reactive capping versus dredging to native material will be determined during more detailed evaluations of the alternatives that will be presented in the FFS Report. Under this alternative, it is expected that there would be more sediment removed via dredging than cap material placed; therefore, this alternative would likely result in a mudline elevation that is deeper on average than the current mudline.

If localized areas with high groundwater dissolved phase contaminant concentrations and/or high rates of advection in native material are identified during the FFS or remedial design phases, sand

reactive caps or armored reactive caps (instead of a sand backfill layer to manage residuals) may be installed in those localized areas following removal of sediment down to native material.⁵

ISS would be implemented in localized areas where other GRAs and technologies are not feasible (e.g., adjacent to unstable shorelines or sensitive structures).

Alternative EB-E

Alternative EB-E would include the same remedial technologies and process options as Alternatives EB-B, EB-C, and EB-D. Under this alternative, sediment in the federally authorized navigation channel would be removed down to an elevation necessary to accommodate placement of a cap below the current authorized navigation channel depth, or to native material, whichever is shallower. Areas that are dredged to native material will be covered with a sand backfill layer, if necessary, to manage residuals based on post-dredge sampling. In the remaining areas of East Branch, a combination of dredging and/or capping would be performed.

If localized areas with high groundwater dissolved phase contaminant concentrations and/or high rates of advection in native material are identified during the FFS or remedial design phases, sand reactive caps or armored reactive caps (instead of a sand backfill layer to manage residuals) may be installed in those localized areas following removal of sediment down to native material.⁶

ISS would be implemented in localized areas where other GRAs and technologies are not feasible (e.g., adjacent to unstable shorelines or sensitive structures).

Alternative EB-F

Alternative EB-F would include the same remedial technologies and process options as Alternatives EB-B, EB-C, EB-D, and EB-E. Under this alternative, sediment would be removed down to native material and covered with a sand backfill layer, if necessary, to manage residuals based on post-dredge sampling.⁷ This alternative would result in a mudline elevation that is deeper than the current mudline.

If localized areas with high groundwater dissolved phase contaminant concentrations and/or high rates of advection in native material are identified during the FFS or remedial design phases, sand reactive caps or armored reactive caps (instead of a sand backfill layer to manage residuals) may be installed in those localized areas following removal of sediment down to native material.⁸

⁵ The extent to which COC concentrations in groundwater and seepage rates require a cap to control chemical migration into the sand backfill layer and surface water would be further evaluated during the FFS and remedial design phases.

⁶ See Footnote 5. If it is determined through future evaluations that capping is necessary following removal to native material within the currently authorized navigation channel, the extent to which native material may need to be removed to facilitate placement of a cap below the authorized navigation elevation plus buffer would be evaluated during the FFS and remedial design phases.

⁷ Some localized areas of sediment may be left in place where dredging is not feasible (e.g., adjacent to unstable shorelines or sensitive structures), and ISS may be implemented in these areas.

⁸ See Footnote 6.

ISS would be implemented in localized areas where other GRAs and technologies are not feasible (e.g., adjacent to unstable shorelines or sensitive structures).

Monitoring

Short- and long-term monitoring would be necessary to assess the quality of implementation, completeness, and effectiveness of each active alternative (the no action alternative would not include monitoring).

Baseline monitoring would be conducted prior to remedy implementation to determine existing conditions that also can be used as additional reference data throughout construction and long-term monitoring. Baseline monitoring does not include the same quantity of parameters and spatial extents as those during development of a conceptual site model, RI, or FS. Rather, these prior studies are used to develop a select list of areas and parameters for baseline monitoring.

Construction-phase monitoring would involve monitoring of the parameters of concern during the implementation of a remedy for contaminated sediment. Parameters may include monitoring impacts to local biota, turbidity monitoring, and other water quality criteria. During and directly after construction, monitoring (e.g., cap construction and thickness, dredging depths, backfill placement, and other elements of the design) would be performed to verify adherence to design documents. This monitoring could be performed in numerous ways, including bathymetric surveys, diver inspections, and verification sampling.

Operations, maintenance, and monitoring (OMM) refers to any operations and maintenance required after the remedy is implemented. OMM may refer to monitoring and repair of shoreline areas or marine facilities damaged because of remedy implementation. This may also include monitoring through site surveys or inspection (e.g., cap placement areas for damage and disturbance, and establishment of benthic communities). If shoreline restoration or other improvements are implemented that involve plantings or habitat elements, OMM could include monitoring of initial plantings and maintenance or repair to planting areas that may have experienced deficient growth.

Long-term monitoring (after the remedy implementation) is assumed as a necessary part of all the active alternatives (i.e., not including the no action alternative) and would include monitoring to assess the general status and performance of the remedy and achievement of East Branch Remedial Action Objectives (RAOs). Depending on the full scope of selected technologies for the comprehensive alternatives to be evaluated in the detailed analysis of alternatives, technology-specific long-term monitoring may be necessary to monitor remedy achievement of RAOs over time. The exact monitoring needs would be determined based on the selected remedy.

Lastly, because this early action is anticipated to be constructed before the rest of the creek is remediated and because there are ongoing sources to the East Branch study area, it will be

important to design a monitoring program that can confirm the selected remedy is functioning as intended while distinguishing remedy performance from inputs from ongoing external sources and other portions of Newtown Creek.

Next Steps

The alternatives presented in this memorandum will be incorporated into the East Branch FFS Report.

References

Anchor QEA (Anchor QEA, LLC), 2022. *Feasibility Study Work Plan Addendum 1: East Branch Early Action Focused Feasibility Study Work Plan*. Remedial Investigation/Feasibility Study, Newtown Creek. October 2022.

USEPA (U.S. Environmental Protection Agency), 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*. Interim Final. EPA/540/G-89/004. OSWER Directive 9355.3-01. Office of Emergency and Remedial Response, Washington, DC.

USEPA, 2005. *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*. Office of Solid Waste and Emergency Services. EPA-540-R-05-012, OSWER 9355.0-85. December 2005.